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Journal of the Society of Arts.

FRIDAY, APRIL 25, 1856.

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NINETEENTH ORDINARY MEETING,

Wednesday, April 23, 1856.

The Nineteenth Ordinary Meeting of the One Hundred and Second Session was held on Wednesday, the 23rd inst., Roger Fenton, Esq., in the Chair.

The following Candidates were balloted for, and duly elected Ordinary Members:—

Barnes, Richard
Barnes, William
Brackenbury, Rev. John Matthew
Goderich, Viscount, M.P.
Gretton, John
Yarnold, John

The following Institution has been taken into Union since the last announcement:—

413. Richmond (Surrey) Parochial Library and Reading Room.

The paper read was—

ON PHOTO-GALVANOGRAPHY; OR ENGRAVING BY LIGHT AND ELECTRICITY.

By Herr Paul Pretsch, late Manager of the Imperial Printing Office, Vienna.

In the present century the agents, light and electricity, have assumed an importance in science and art unknown to previous ages. They constitute at present the leading subjects of scientific investigation. The social influence exercised by their applications has caused light and electricity to be regarded as essentials, not merely on account of the position they hold in the physical universe, but because they have become the ready servants of our will. It is not necessary to enumerate here applications which are familiar to all. The present paper has reference to an application in which both agents are mainly concerned in producing a desired result, an application, too, the social bearings of which, it is humbly conceived, will be of no mean importance. Photo-galvanography, or engraving by light and electricity, forms the subject of this paper.

Having been for many years engaged as Manager of the Imperial Printing Office, at Vienna, the productions of which were so greatly admired in the Great Exhibition of 1851, I have turned my attention to rendering the discoveries and results of science applicable to several graphic processes and to printing purposes. Very soon after the introduction of photography, I felt the importance of this beautiful art in re-producing and imitating most of the wonderful productions of nature and art, and I saw plainly enough that photography could assist the real artist in the creations of his own mind or in multiplying his works. I was entrusted to set up a photographic establishment at the Imperial Printing Office, and I was fortunate enough at the Great Exhibition of 1851 to gain a prize medal. The pictures there obtained have been chiefly used as originals for engraving on steel, copper, wood, or for the lithographic draughtsman. The result of my attention to this subject was the idea of producing by means of photography a plate from which we might print with common printers' ink. Many learned and scientific investigators throughout Europe were equally impressed with the importance of such a result. Permit me, therefore, to mention here the valuable labours of my predecessors, and the methods which they have adopted for solving the problem.

Dr. Berres, in Vienna, who died shortly after his important investigations, was one of the first in this field. He executed at a very early period in photography some prints from etched daguerreotypes possessing great merit. He used a solution of gum arabic and nitric acid. About that time there was in existence a process which gave very perfect but faint results; it consisted in the use of bichromate of potass with the addition of aqua regia, fixed by washing with ammonia. I am unable to give the details of this process.

Mr. W. R. Grove, in London, used the daguerreotype plate as the anode in a decomposing trough filled with diluted muriatic acid, and as the cathode a platinum plate, both plates being connected with a single cell galvanic battery.

M. Fizeau, in Paris, has also tried to solve the problem. He etched his daguerreotype plates by covering them with a mixture of nitric, muriatic, and nitrous acids, or with a mixture of nitric acid and nitrate of potass and chloride of sodium. He repeated the process several times, cleaning his plate each time with caustic ammonia. The faint etched lines or tints were afterwards filled with printers' ink, capable of rapidly drying; the whole surface of the plate was then gilt, the dried ink removed, and the plate etched with nitric acid. All these investigators have used daguerreotypes upon silvered copper or real silver plates; they all were struck with the minuteness and beauty of the details, but they complained of the faintness of the etched parts, and confessed that no printer's ink could enable them to reproduce the beauty of all the parts visible upon the plate.

I have the honour to lay before you two prints of daguerreotype plates, etched as above-mentioned. They were executed about ten years ago, in Vienna.

Within the last six years, several trials, with a similar object in view, have been made at the Imperial Printing Office at Vienna. The medallion which I now show you was executed by me upon copper, in 1850. This was thus produced;—A fresh made and unfixed positive (upon common paper, prepared in the usual way, with chloride of sodium and silver) was transferred by pressure to a clean copper-plate, then treated or developed with a solution of ammonia, then exposed to or etched by the vapour of iodine, after which it was finished by the hand of an experienced aquatint engraver.

I have here another specimen of an etched daguerreotype picture, executed in 1854 in the same establishment. A perfect picture is taken upon silvered copper, or upon real silver; the four edges are bent up for convenience in manipulation, and the picture is fixed in the common way by hyposulphite of soda. From this time until the end of the etching process the plate must not be allowed to become dry. When fixed, the plate is placed upon a stand in a horizontal position, and warmed, until what remains of the hyposulphite of soda begins to evaporate. The solution is then poured off, and the plate is washed several times with distilled water, which must be also heated. Then a weak solution of gum arabic is poured upon the plate, to which is added the etching mixture, consisting of two solutions—viz. 1 part of pure nitric acid 45° Beaumé, and 11 parts of water; 2 parts of pure chloride of sodium, 1 part pure nitrate of potass, and 40 parts of water. Of these solutions, take 9 parts of the diluted acid, and 1 part of the solution of salts. This etching liquid must be well distributed over the gum solution upon the plate, which may be done by using a pointed glass tube, and by sucking in and blowing out the fluid. The plate is warmed, and the solutions moved several times; the picture vanishes, but appears again of a black-blue tint upon a white-grey ground. It is then washed with water, again warmed, and a diluted solution of ammonia is poured on, which is allowed to remain upon the plate until all the chloride of silver in the etched parts is removed. The plate is again washed with water, then a diluted solution of iodine is poured on it, and it is afterwards warmed until it becomes yellow; it is again washed, and the iodine removed by hyposulphite of soda, and afterwards washed and dried. The etched plate so obtained is very faint, and although an ink specially prepared for the purpose has been used, consisting of a mixture of wax, turpentine, and plumbago, a specially prepared glossed paper, and a special mode of printing, the impressions still exhibit faintness.

I now turn to the valuable investigations of M. Niepce de St. Victor. His process consists in the employment of bitumen of Judea, dissolved in etheric oils, as a coating for a steel plate. The coating when dry is exposed, with the object to be copied, in a copying frame, to the influence of the light. After sufficient exposure, the plate is washed with similar etheric oils. It is next finished by etching and engraving. The last exhibition of the Photographic Society showed some specimens executed in this method by M. Negre, in Paris.

Lerebour, Barreswill and Lemercier have applied bitumen and resinous substances in a similar manner on the lithographic stone, with the exception, however, that the stone requires a different method of treatment after exposure.

While on this subject, I may mention an original idea, published in Germany by M. Halleur. He took a lithographic stone grained for chalk-drawing, and prepared its surface by washing it with a very diluted but neutral solution of oxalate of iron. This he repeated several times. After the solution was sufficiently soaked into the stone, the moist or damp stone was exposed in the camera. The time of exposure varied. When sufficiently exposed, the picture appeared in a brownish colour upon the stone. It was washed and fixed by a solution of carbonate of ammonia, and finished by being well washed with water. The picture was then upon the stone, and had to be prepared, that is to say, it must be made capable of taking the fatty ink, save in the white parts that must remain clean. This was done by washing the surface with a very diluted solution of oxalic acid. The stone was then treated like a common lithographic stone.

The peculiarity discovered by M. Niepce, that the vapour of iodine adhered to the black parts of a print or drawing, has been applied by Messrs. Salmon and Garnier to the production of etched plates for copperplate-printing, or of prepared plates for chemical printing, such as zincography, &c. The last mentioned gentlemen have also proposed to submit a brass-plate to the vapour of iodine, and then to place the photographic original upon the plate for the purpose of exposing the arrangement to the influence of the light. Where the plate has been protected from the light (all the dark parts of the picture) mercury can be amalgamated; but it refuses to attach itself wherever the iodine has been influenced by the light (the white or light parts). I have not seen any specimens by this method.

Lastly, I have to mention the investigations of Mr. Fox Talbot, to whom the art of photography owes already so much, and to whom are justly due the thanks of the scientific world. I mention this gentleman last, because some materials of his process are used in my method, although in another way and for another result. He uses gelatine and bichromate of potash for the purpose of what may be termed a photographic *etching* ground. The leading idea in his process is etching,—he obtains the desired result, viz., an etched surface, by the use of bichloride of platinum for the purpose of biting into the steel the copy of the picture.

Having given the foregoing brief *resumé*, it remains for me to observe that any process, the results of which are dependent upon etching, is uncertain from that very cause. Etching, it is well known, cannot be properly completed in one operation; it is necessary to etch and re-etch to obtain different tints, by which means the real touch of nature or art is likely to be sacrificed. In the process which I have now the honour to lay before you—the method of etching is abandoned, the fundamental principle being the possibility of producing photographically on the material used a printing surface of relievo and intaglio parts, instead of a mere picture made up of lights and shades. In this process the picture appears at once in all its depths, tints, half tints, and chiaroscuro. The plate serves only as a basis for coating, while the plate itself is not at all altered by the process. I can use the same plate over and over again, until it is broken or otherwise spoiled.

I took out a patent in England November 9th, 1854, and in France, June 1st, 1855, and, therefore, some time before M. Poitevin's experiments were announced to the public.

The earlier steps of this photo-galvanographic process are similar to those adopted by the photographer on glass. My invention consists in adapting the photographic process to the purpose of obtaining a raised or sunk design on a glass or other suitable plate covered with glutinous substances, mixed with photographic materials, which design can then be copied by the electrotype process, so as to procure plates suitable for printing purposes. The operator first coats a glass plate with a gelatinous or glutinous solution, suitably prepared with chemical ingredients, sensitive to light, as follows:—One part of clear glue is soaked in about 10 parts of distilled water, but the quantity of water depends upon the strength of the glue and the state of the atmosphere. Meanwhile, there are prepared three different solutions, viz.—a very strong solution of bichromate of potass, a solution of nitrate of silver, and a weak solution of iodide of potassium. The glue is dissolved by heat, and a small quantity of it is added to each of the two solutions of silver and iodide. The remaining greater portion of the glue is kept warm, the solution of bichromate of potass added, and well mixed. After which the small portion of the glue with silver is added, and also mixed well, and allowed about ten minutes time for combining. Finally the small portion of the glue with the iodide is added, the whole mixture strained, and it is then ready to be poured on the plates of glass or other suitable material. When dry, the coated plate is ready for exposure. The photographic picture, the drawing, print, or other subject to be copied, being laid on the prepared coated surface, they are to be placed together in a photographic copying frame, and exposed to the influence of the light. After a sufficient exposure, which is exceedingly variable, according to the intensity of the light, the plate is taken out from the copying frame, when it will be found to exhibit a faint picture on the smooth surface of the sensitive coating. It is then washed with water, or a solution of borax, or of carbonate of soda, as may be necessary. The whole image comes out in relief with all its details, and, when properly done, with all its brilliancy.

If the original is a photograph, chalk, sepia, or Indian ink drawing, the copy represents the different tints in grains; if in lines, the copy will reproduce the lines.

When sufficiently developed, it must be washed with spirits of wine. The surplus moisture is removed, and the plate is covered with a mixture of copal varnish diluted with spirits of turpentine. After some time, the superfluous varnish must be removed by oil of turpentine, and the plate treated again, or immersed in a very weak solution of tannin or other astringent liquid. During this part of the process the plate must be carefully watched and removed as soon as the picture or design is considered sufficiently raised; it is then washed in water and dried. In this state the plate is ready to be copied. This may be effected by the customary methods of rendering the coating conducting, and placing it in the electrotype apparatus, producing an intaglio copper-plate; or, if first moulded, the intaglio mould furnishes the means of obtaining a relievo plate by electro-deposition in a similar way. To produce a *sunk* design on the prepared plates, I proceed as before, but after washing with the spirits of wine the plate must be dried on a warm place, and in due time the picture or design will appear sunk like an engraved plate. The printing plates are produced as before described.

If an intaglio plate is made, it may be printed from at the common copper-plate printing press; on the other hand, the relievo plate may either serve as the matrix for producing an intaglio printing plate, or it may be itself employed in "surface" printing, like a wood-cut. In the latter case, the narrow lines of the impression being sufficiently raised, the broad white spaces must be cut out on the printing plate, or built up in the matrix. The common, well-known stereotype process also affords another means of producing the necessary plate.

It is well known to practical men that any impression made by fatty ink can be transferred on stone or zinc, for the purpose of printing from it in a chemical way. This method can be also used in the present process, and there are some hopes of obtaining a good impression from the first glass plate, which can be transferred and printed.

I am unable to lay down a more exact method of treatment, as much depends on the nature of each case, the state of the atmosphere, the quality of the glue or gelatine used, &c.

Instead of the iodide of potassium, the bromide of ammonium or iodide of ammonium may be employed, as they shorten the time of exposure. In some cases the camera may be employed with great advantage, especially if the above described coating is used as a ground or basis for albumen or collodion, for the purpose of getting a picture in a shorter time, which picture is then treated like the original in the copying-frame. If required, we can expose such a plate to the influence of the light without a pressure-frame, and have the advantage that the picture or original is in immediate contact with the sensitive coating.

Although much has been done by this method, and many kinds of glue, gelatine, and similar materials, have been tried, the mode above described has been found most useful. Some improvements may be made in future, but the principles of the method are founded on a sound basis, and will experience, I think, an extensive application.

The process, too, affords the means of obtaining exact counterpart plates by the usual electrotype process, which may be used, therefore, for multiplying the plates without repeating the first process.

Thus photography may be advanced a step further, and made to become the handmaid of the graphic arts. This beautiful art is thus rendered far more practically and enduringly valuable than it has hitherto been. The impressions from the photo-galvanographic plates exhibit a tint much superior to mezzotint or aquatint, whilst whatever touches appear in nature are reproduced at the printing press with a fidelity which no artistic labour can rival, and which, in many cases, the human hand could never engrave. If an artist's original design is required to be produced, it appears in print without the alteration of a single line or touch, and on any scale.

It is well known, too, how very liable photographic originals are to change; and, in a series of copies even from the same negative, there is a constant want of uniformity in the shade of colour. With this printing process, however, we are independent of such drawbacks, as the plate impressions are in ink, and the attention of an ordinary printer suffices to keep the pictures to the proper tone.

I cannot conclude without expressing my hearty thanks for the valuable assistance which I have received in England from those gentlemen who have had a sufficient confidence in the method to form a company for carrying it out.

DISCUSSION.

Mr. Malone thought it would be interesting to compare some of the results of the best of the old photographic engraving processes—that of M. Fizeau—with the results of the new process now before the meeting. He exhibited some specimens lent by M. Claudet, who, with M. Fizeau, patented, about the year 1844, the method by which they were obtained. It would be seen that M. Fizeau's process furnished pictures of far greater merit than the faint designs alluded to by Herr Pretsch as characteristic of daguerreotype etchings. These plates, especially the architectural subject, showed that drawings of great vigour could be produced, comparable, he thought, with any "untouched" specimens of Herr Pretsch's new process. He then produced other prints which had been improved by the hand of the engraver, showing the applicability of the method in a variety of cases. An impression of a photographic plate of an anatomical subject, showing the complicated arrangement of a fine net-work of nerves, would bear comparison with any of the specimens by Herr Pretsch. So that, in the specimens "untouched" and "touched,"— a distinction to be carefully noted—the two processes ran in a more parallel line than the paper would lead one to believe. It was true that at first the designs were so faint that ordinary printing ink would not enter the fine grain of the etching; but by the efforts of more than one of our large London printing establishments, a suitable ink was found, which, being still of a carbonaceous character, gave a blacker impression than the plumbago mixture referred to by Herr Pretsch. He (Mr. Malone) might perhaps be allowed to remark, that, having been engaged for nearly two years in experimenting upon this process, he had had more opportunities than most persons of judging of its capabilities. The method by which the vigorous impressions he exhibited had been produced, was briefly as follows:—An ordinary daguerreotype was taken before being coated with gold, and was submitted to an acid liquid partly composed of "nitrite," not "nitrate" of potass, by which the shadows of the picture were first etched, the high lights remaining untouched; after a time, the half tints began to "bite" in, the shadows still deepening. By repeated boilings in a solution of caustic potass, the half-tints were preserved, and the whole process terminated as soon as the lights of the picture began to be etched. The plate was then inked and cleaned off as if for printing; and when dry, was coated with gold by electrotyping; the ink was then removed by potass, and the plate further etched by ordinary engraver's acid, no touching or "stopping out" being necessary, although, of course, any amount of hand skill might be exercised, if thought desirable. There were more instances than one of parallelism in the two processes. M. Fizeau, foreseeing that the wear and tear of a silver gilt plate might become costly, did what, perhaps, was tolerably obvious to those acquainted with the electrotype; he deposited copper upon the photographic etched plate, and obtained a matrix from which any number of plates, fac-similes of the original, could be obtained, the original remaining unworn, ready to supply further plates for wear and tear or accident. The plates he held in his hands were produced in the manner just described, and had been in his possession nearly twelve years, and from them the impressions before the meeting were printed. This part of the photo-galvanographic process, therefore, seemed to be a simple repetition of M. Fizeau's method. Mr. Malone begged that it might not be thought that he desired to depreciate the very beautiful process of Herr Pretsch; he wished simply that the two processess might be fairly represented to the meeting, leaving experience to point out which might be eventually adopted. Mr. Malone mentioned that he had lately seen in Paris specimens by M. Poitevin upon lithographic stone, which he could not distinguish from those on the table. He believed the processes must be nearly identical.

Herr Pretsch replied, that he had priority of publication, and thought M. Poitevin's attention had been directed to the subject in consequence of such publication.

Mr. Malone asked if he might infer, from a remark of Herr Pretsch, that most of the proofs on the table were finished by the engraver.

Herr Pretsch said, the graining appeared immediately by the first treatment of the plate. If anything at all was done to the plate it was merely cleaned. Some of the plates had not even been touched. Every grain and spot appeared in the first instance. The specimens in Mr. Malone's hands had not been touched at all.

Mr. Malone observed, that it was important to bear in mind, in comparing the two processes of Fizeau and Pretsch, that some of the specimens had been touched in both instances.

Mr. M. Hanhart said, the difficulties hitherto experienced in the production of photographic plates which would yield impressions in the ordinary printing press, had prevented the application of the process to the extent that was desired. Judging from the specimens Herr Pretsch had brought before the meeting to illustrate his new process, most of them being, as he asserted, impressions from copper plates that had not been touched by the engraver, he thought we might safely look forward to greater perfection in this interesting application of the art of photography. One of the specimens happened to be a reduced copy of a lithographic print well known to him (Mr. Hanhart), and he could recognise all the peculiarities of the grain, proving that the entire effect had been produced by the photographic action. He was too little acquainted with the different modes by which a somewhat similar result had been obtained on copper, to offer any remarks as to their comparative efficiency, but he would call attention to photo-lithography, of which there were some specimens on the table, by M. Lemercier. They were very interesting and promising, but still, on comparing them with the original photographic impressions, they left much to be desired. Any one acquainted with lithographic operations would make allowance for the difficulties that had to be overcome. In M. Niepce's original process the stone had to receive a coating of bitumen dissolved in sulphuric ether. When the bituminous surface was exposed to the sun's rays it became insoluble, or rather less soluble in ether. When, therefore, the surface had been acted upon by light, through the medium of a negative photograph, and was washed with ether, the parts that corresponded with or lay under the light part of the negative would remain intact, while those that lay under the dark part were washed off. This having been accomplished, the stone had to be prepared with gum and nitric acid. This, a delicate operation with an ordinary drawing on stone, became even more so in this case; the film of bitumen that remained after the washing offering so little resistance to the action of the acid on the stone, the necessary effect of the gum and acid being to change the surface, and render it incapable of retaining the grease of the printing ink. The effect of bitumen was also very different to that of lithographic chalk or ink, with which a "printable" drawing on stone had to be made. Bitumen did not combine with the stone, and therefore did not print; its action seemed to be preservative; and stearine or oleine had to be made to act upon the parts of the surface of the stone that remained covered with the bitumen, before impressions could be taken. When we considered the excessive minuteness of the silver deposit on the photographic negative, to which the printing part of the surface must correspond to produce an equally satisfactory impression as the one obtained by the photographic printing, we might readily understand why photo-lithography had not yet become so extended in its application as was to be wished. How far the ingenious method brought before the meeting that evening would realise our expectations time would show.

The Chairman said, a gentleman near him would be glad to know how many impressions could be taken from one of these plates.

Herr Pretsch replied, from 300 to 400 copies. There was this advantage, that as the matrix was preserved, they could multiply the printing plates to any extent they pleased.

Mr. Thurston Thompson remarked, that not yet having had an opportunity of making a minute inspection of the spcimens before them, he was not able to form a definite opinion on the subject, but judging from what he had seen, it seemed to him that the process was complete, and the prints effective and good. There might, however, be details which would disappoint him by-and-by. He thought 300 or 400 impressions was a very small number to obtain from a plate.

The Chairman remarked, that Herr Pretsch had stated that any number of plates might be taken from one matrix. He begged to ask whether any information could be given as to comparative cost.

Herr Pretsch replied that the chief material used, viz., gelatine, was an inexpensive article, and the same might be said of the chemicals applied to the materials. Of course, the production of plates by means of the electrotype process, would always be attended with a certain amount of expense.

Mr. Malone inquired if galvanic agency had anything to do with the production of the image, either in improving it or otherwise, as the title of the invention might lead one to suppose.

Herr Pretsch explained that the electrotype process was only a copyist of the gelatine plate.

Mr. Malone thought the title was a misnomer, and remarked on the desirableness of accurate nomenclature. He stated that the only true photo-galvanographic process in existence that he knew of was that of Mr. W. R. Grove, in which the image was obtained by the action of light, and really engraved by galvanic or voltaic electricty.

Mr. Claudet, F.R.S., also thought, that inasmuch as electricity had nothing to do with the production of the image, the term photo-galvanography was not a proper one to apply to the process.

Herr Pretsch remarked that so long as the results were obtained, he was indifferent by what name it was called.

The Chairman said he had invited the opinions of those present upon this subject, and he would now express an opinion himself. When specimens of these productions were laid before him some fifteen months ago, he was struck with the great ingenuity of the thing, and although he had a preconceived opinion against the success of the application of photography to engraving, at the same time he saw so much that was beautiful in this new process, that he could not but encourage Herr Pretsch to proceed with it. Since that time he (the chairman) had been absent from England, and therefore had not seen the progress which had been made in the interval, but on his return he had the opportunity of inspecting the improved productions of Herr Pretsch during the last year, and he would say, if the progress during the next twelve months was equal to that of the last fifteen, they would have to sell their photographic printing frames, and a new process would be introduced which, he believed, would supersede almost every other method of reproducing natural objects. In all the previous methods of photographic engraving, the great defect was their failure in producing flat, clear, and equal shades. In that point they all failed. Some had succeeded in producing lines, &c., with clearness, but not a flat, even, delicate shadow. Even the invention before them he considered was deficient in that respect, but it showed such signs of ultimate success that he could not but encourage the inventor to proceed with it. He thought, with the assistance of photographers and the engraver's art, it would be brought to a successful result. A few days ago he paid a visit to the establishment where this process was being carried out, and he was shown a picture upon a gelatine plate presenting only a faint impression on its surface, but when the gelatine plate was subjected to the usual process of washing in water and solutions of borax, and in alcohol, accustomed as every photographer was to the marvellous development of the photographic image, he certainly was as much struck when he saw the engraving appear in relievo as he first was with the appearances on the negative plate; from a flat surface it became at once an image in beautiful relievo. He thought the question of intaglio engraving was settled by this invention, since he could not conceive but that it would be made to produce more perfect representations than they had yet seen. With respect to another branch of the art of engraving there was greater difficulty—he alluded to surface printing. They were aware of the defects of the present mode of surface printing. Every artist who had his pictures engraved for publication in the weekly illustrated papers, suffered from the present mode of surface engraving. Even if he made his own drawing, it would require in the engraver upon wood intelligence and skill equal to his own, to convey a faithful reproduction of his work to the public mind. But by the process now before them, the artist would be independent of the engraver; he might make his own drawing, and, so far as the lines went, it would be faithfully reproduced. The only question was that of expense. The principle being admitted, he had no doubt the details would follow. He was sure they would agree with him that the best thanks, not only of the Society, but of the artistic world in general, were due to Herr Pretsch for the intelligence and perseverance he had displayed in the perfecting of this process, and he was certain they would all rejoice at the success which had been already attained.

Herr Pretsch having returned thanks,

The Secretary announced that the paper to be read on the evening of Wednesday next, the 30th instant, was "On the Printing of Fabrics, with special reference to Shawls and Carpets," by Mr. Joseph Burch.

SURPLUS FROM PATENT OFFICE FEES.

The Committee appointed by the Council to consider and report on the letter of Sir Joseph Paxton, met on Thursday, the 17th inst., at the Society's house, Sir Joseph Paxton, M.P.. in the chair.

The Secretary read the following report from the Sub-Committee, appointed at the previous meeting of the Committee, "to consider the details requisite to be carried out for placing the Patent Office in a state of efficiency:"—

Report.

The sub-committee, considering the great difficulties which would attend any proposal to alter the existing law of Patents for Inventions, have confined their attention to such suggestions for the further improvement of the patent system as may be advantageously carried out without the necessity of fresh legislation. Acting under this consideration they would recommend that the following suggestions should be adopted:—

Firstly.—That the whole revenue derived from the fees paid for letters patent should be appropriated to such purposes as will promote the beneficial operation and improvement of the patent system, and encourage and aid the progress of invention.

Secondly.—That proper and suitable buildings should be provided for the offices of the Commissioners of Patents. It is at once apparent, even to the casual visitor, that the present offices are exceedingly inconvenient, and limited in their accommodation; and the Commissioners of Patents should be solicited to provide a remedy by immediately exercising the powers given by Section IV. of the Patent Law Amendment Act of 1852.

Thirdly.—That the printing of all the specifications filed previously to 1852 be completed as soon as possible, and that, where it is advisable, they should be classified in regular series.

The Commissioners, in their report of 1854, state that they purpose completing the publication of the old specifications in six years, by printing them at the rate of about 2,000 per annum; and to prepare the way for effecting this object, the surplus income from the patent fees of 1853 was carried to 1854. But there is no doubt that, by continuing to act upon the precedent of 1854, the mass of valuable information contained in the old specifications may be rendered accessible to the public at a much earlier period than the year 1860.

Fourthly.—That the library which has been opened for the use of the public in connexion with the specifications and indexes, under the act of 1852, be further extended, and that better accommodation be provided for those who visit it for the purposes of consultation.

The greater part of the works of reference which are at present in the library are merely *lent* for the use of the public, and steps should be taken for securing them as the property of the office. Numerous official publications of foreign countries, relating to patents, have been presented to the library, and these valuable series should be made as complete as possible. It may be worthy of remark, that the United States Patent Office devotes about £600 per annum to the extension and maintenance of its library of reference.

Fifthly.—That the system adopted by the Commissioners of presenting copies of their publications to all Free Libraries in this country, and of interchanging them for the official publications of foreign countries, be carried out on a most liberal scale.

In many parts of the United Kingdom Free Libraries have been established for the express purpose of receiving the Commissioners' works, so that they have been the means not only of supplying, but of creating Free Libraries. They will have it still further in their power to benefit these local libraries, if the communications which have been opened between the Patent Office and foreign governments be extended, and duplicate copies of foreign official publications be obtained, and presented to the Capitals and Chief Towns of the United Kingdom.

Sixthly.—That the system of indexing and classifying, found so efficient in the case of English Patents, be applied as far as possible to the foreign publications relative to foreign patents which have been, or hereafter may be, procured by the Patent Office, so as to afford the English inventor every facility for obtaining information respecting foreign inventions.

The close intercourse and rivalry which now exists between the leading manufacturing countries renders it necessary to ascertain the progress of invention in other countries, as well as our own. It should also be borne in mind that any description of an invention contained in a foreign publication, which is accessible to the public in England, will invalidate a patent taken out here for a similar invention. It has, therefore, become incumbent on the English patentee to extend his search, not only to prior English specifications, but to foreign ones as well.

Seventhly.—That a judiciously-selected series of models be collected, and arranged so as to mark and illustrate the progress of invention in the leading branches of art and manufacture.

It is not intended to recommend an indiscriminate or over-grown collection of models, but it is believed that the Patent Office has at its command peculiar facilities for obtaining—principally by way of gift—most valuable models, which merely require to be properly arranged and preserved to become a ready and interesting source of information to the public.

Eighthly.—That the system of registering proprietors of Letters Patent, as now adopted in the Patent Office, be rendered more simple.

It is at present the practice to register all assignments of shares or interest in a patent, in the very words of the assignment in full. This practice, besides entailing unnecessary expense, is objected to by many proprietors, who are not desirous that the exact terms of agreement between themselves and their joint owners should be made public; nor does there seem any advantage to the public in it.

Resolved—That the foregoing report be received and adopted.

Resolved—That a memorial be addressed to the Commissioners, embodying the report of the Sub-Committee; that it be laid before the Council of the Society of Arts;

and that the Council be requested to communicate with the Commissioners, and ascertain when it will be convenient for them to receive a deputation from this Committee, with the memorial they propose to present.

TRADE MUSEUM.

ANIMAL PRODUCE DEPARTMENT.

The following communications have taken place between the Royal Commissioners for the Great Exhibition of 1851 and the Society of Arts, relative to this collection :—

On the 30th of June last, a deputation from the Council waited upon the Royal Commissioners to confer with them relative to the ultimate disposal of this collection. The following extract from the Minutes of the Council shows what took place at this interview :—

Extract.

" Minute of what took place at the conference between the Royal Commissioners for the Exhibition of 1851, and a deputation from the Council, on Saturday, 30th June, 1855, relative to the Trade Museum Collection.

" Viscount Ebrington reported that a deputation, consisting of himself, Dr. Booth, Mr. Redgrave, and Mr. Saunders, had waited upon the Royal Commissioners for the Exhibition of 1851, on Saturday, 30th June, to confer with that body relative to the Trade Museum Collection.

" His Royal Highness Prince Albert, as President of the Commission, informed the Deputation that the Commissioners were fully impressed with the importance of the collection being at once placed in a situation suitable for its completion and display, and that for this purpose they had determined forthwith to erect suitable temporary buildings on the Commissioners' estate at Kensington Gore, in which this collection with other collections might be placed until the permanent building intended to be erected there should be ready for their reception.

" His Royal Highness further informed the Deputation that it would be desirable that the Council of the Society of Arts should place the Commission in possession of their views relative to the ultimate disposal of the collection, and requested to know how much longer the Council could keep the collection displayed as at present.

" It was replied that the Council could not, without very considerable inconvenience, set apart its rooms for the display of the collection longer than two months from the present time, and that under any circumstances the collection could not be shown at all in the Society's rooms for longer than three months, as the rooms, at present very inadequate for the exhibition, would be required for other purposes.

" Viscount Ebrington said, that the members of the Council present were a deputation only, and could not pledge the Council.

" The Deputation undertook to report to the Council the information afforded by the Commission, and to communicate at an early period the views of the Council relative to the proposition of the Royal Commissioners."

1.—Society of Arts to Her Majesty's Commissioners.

Society of Arts, Adelphi, London.
July 16th, 1855.

Sir,—I am directed by the Council to forward to you, for the information of the Royal Commissioners of the Exhibition of 1851, the following extract from the minutes of Council held on Wednesday last.

Extract.

" The Secretary reported that he had received the following letter from Sir Joseph Paxton :—

" ' Rock Hill, Sydenham, July 6th, 1855.

" ' Dear Sir,—I am called away to Paris for a few days, and as it is possible that in my absence some inquiries may be made of you relative to my proposal at the dinner on Tuesday last, I think it well to write and explain, for your information, what my proposal included.

" ' On the part of the Crystal Palace Company, I should propose to give your Society ample space and every requisite facility for the exhibition of a Trade Museum at the Crystal Palace, to give free admission to the Council and Officers of the Society, and as the Museum might be placed in connection with our Raw Produce Department, to pay half the salary of a caretaker who might attend to both.

" ' Our directors are all absent, and I write this on my own responsibility, but with the conviction that they will confirm the offer made by me.

" ' I believe also, that should there be any difficulty in consequence of the expense to which the Society of Arts may have been put in connection with the museum, the Crystal Palace Directors would not be indisposed to assist in providing for it.

" ' I am, &c.
(Signed) " ' JOSEPH PAXTON."

" Resolved,—That the Royal Commission, having a joint interest with the Society in the property of the Trade Museum, be informed of the offer with reference to it made by Sir Joseph Paxton, and asked whether the Royal Commission have any wish or opinion to express on the subject."

" Resolved,—That a Committee be appointed to take into consideration the communications which have passed between the Council and the Royal Commissioners and other parties relative to the disposal of the Trade Museum, and to report to the Council thereon."

" That the following gentlemen form the Committee: —Lord Ebrington, Mr. Macdonald, Mr. Redgrave. The Chairman and Deputy Chairman to be summoned."

I have, &c.,
P. LE NEVE FOSTER,
Edgar Bowring, Esq. *Secretary.*

2.—Society of Arts to Her Majesty's Commissioners.

Society for the Encouragement
of Arts, Manufactures, and Commerce,
Adelphi, London, July 19, 1855.

Sir,—I am directed by the Council to hand you on the other side a copy of a report of the Committee appointed to take into consideration the communications which have passed between the Council and the Royal Commissioners for the Exhibition of 1851, and other parties relative to the disposal of the Trade Museum, and I am to inform you that the report has been received and unanimously confirmed by the Council.

I am further to request that you will be good enough to bring the matter before the Royal Commissioners.

I am, &c.,
P. LE NEVE FOSTER, Secretary.
Edgar Bowring, Esq.

Copy of the Report Referred to in the Foregoing Letter.

" The Committee have considered the correspondence between the Council and the Royal Commissioners and the circumstances connected with the formation of the collection, and also the letter of Sir Joseph Paxton, and have resolved :—

" That it be recommended to the Council that the Secretary write to the Royal Commissioners, and inform them that the Council are prepared at once to transfer the collection to the Royal Commissioners, and will willingly assist in every way in their power to promote the views of the Royal Commissioners, if after consideration of all the circumstances they will,

" 1st. Reimburse the Society merely the sum it will have expended in reference to the collection.

" 2nd. Provide a place for its immediate reception and arrangement with a view to exhibition and its continuance as a permanent and advancing collection.

"But if the Royal Commissioners are unable to carry out this arrangement, then that the Council will, with their sanction, be prepared to make such provision as will ensure those permanent advantages which so important and novel a collection must confer on the public generally, and especially upon the manufacturing interests of the country.'

"The Committee hold it their duty to recommend to the Royal Commissioners the claims of Professor Solly, who has, with great zeal, intelligence, and industry, brought the Trade Museum to its present very satisfactory position."

3.—H. M. Commissioners to the Society of Arts.

Whitehall, August 4, 1855.

Sir,—I am directed by her Majesty's Commissioners for the Exhibition of 1851 to acknowledge the receipt of your letters of the 16th and 19th ult., on the subject of the Trade Museum (Animal Produce Department) which has been formed under the joint authority and at the joint expense of the Society of Arts and the Commissioners, and which is now being exhibited at the Society's rooms.

With respect to the former of those letters, in which you transmit for the consideration of her Majesty's Commissioners, on behalf of the Council of the Society, an extract from their minutes respecting a proposal that has been made by Sir Joseph Paxton, on the part of the Crystal Palace Company, to receive and exhibit the Museum in question at the Crystal Palace on the conditions specified by him, I am to acquaint you, for the information of the Council, that the Commissioners are not prepared to become parties to the acceptance of Sir Joseph Paxton's proposal.

With regard to the proposition submitted by the Committee appointed to consider the question of the Trade Museum, and adopted by the Council of the Society, for the transfer of the whole Museum to her Majesty's Commissioners, on the conditions mentioned in the enclosure to your letter of the 19th ultimo, I am directed to state that the Commissioners are prepared to accept the transfer of the collection, and to provide a place for its reception and arrangement, with a view to exhibition and its continuance as a permanent and advancing collection, as specified in the second of the conditions in question. With reference to this subject, I am to enclose a copy of a paper that has just been laid before Parliament, containing a letter addressed by her Majesty's Commissioners to her Majesty's Government, urging the importance of immediate steps being taken to furnish, in the manner therein pointed out, proper accommodation for the exhibition of various collections of national interest for the due display of which no means at present exist.

The Council, who will be aware that the vote necessary for the purpose has just received the sanction of the House of Commons, will observe that this letter contains an especial reference to the case of the Museum now under consideration.

Her Majesty's Commissioners, in announcing their acceptance of the offer of the Society, and the admission by them of the principle involved in the first of the conditions set forth in the Committee's report, viz., that the Society should receive some reimbursement for the outlay it has incurred in connection with the formation of the Museum, would, however, observe to the Council that they had not been led to suppose, from anything that has passed between themselves and the Society, on the subject of the Museum,—either on the occasion of the recent interview between themselves and a deputation from the Council,—or in previous correspondence,—that the Society looked forward to being repaid the outlay it voluntarily undertook to incur for the promotion of a national object, so intimately connected with the immediate purposes for which the Society was founded, and as there is no expectation that any amount to be paid under this head will be advanced by the Government for the purpose, but must be defrayed out of the limited funds at the disposal of the Commissioners, they will be glad to be favoured by the Council with a statement of the sum which, under these circumstances, they may consider it right to receive on behalf of the Society in consideration of the proposed transfer of the collection.

It affords her Majesty's Commissioners much pleasure to express their entire concurrence in the remarks made in the Report of the Committee on the subject of the valuable nature of the services rendered by Professor Solly in bringing the Museum to its present satisfactory position, and their appreciation of the zeal and ability displayed by him, and of his qualifications for assisting in the further development of the collection. At the same time it appears to them that the question raised in the Report in connection with that gentleman's services is one which scarcely admits of a definite decision at the present moment, but must be reserved for ulterior consideration.

I have, &c.,
EDGAR A. BOWRING.

4.—Society of Arts to H. M. Commissioners.

Society for the Encouragement
of Arts, Manufactures, and Commerce,
Adelphi, London, 17th Oct., 1855.

Sir,—Your letter of the 4th August last, relative to the transfer of the Trade Museum now in the possession of this Society, to the Royal Commissioners, has been laid before the Council, and in reply I am directed to transmit a copy of certain resolutions which have been passed, the effect of which is formally to transfer to the Royal Commissioners the Trade Museum, as now exhibited, together with those specimens of animal, vegetable, and mineral produce which belong to the Society.

The Council, in thus relinquishing the charge of a collection, the formation of which they originated, in whose progress they have always taken a deep interest, and whose present advanced state in so short a time has more than realised their utmost expectations, believe it their duty to record their matured views as to the principles on which a Trade Museum, worthy of the vast trade and enormous commerce of this country and its colonies, ought to be developed.

The Council believe that, to form a Museum of animal produce alone, would be of comparatively little use. A Trade Museum ought to contain animal, mineral, and vegetable products, specially classified with a view to their commercial uses and technical instruction. It would in no way accomplish this object were other Museums of vegetable and mineral produce, already in existence, to be brought into juxta-position with the animal collection. The three collections thus combined would not constitute a Trade Museum; the principles of arrangement, and the classification of a collection of minerals, for example, in a Museum designed for educational or scientific purposes, are quite different from those under which the same collection would be distributed in a Trade Museum designed for commercial reference, technical teaching, and the requirements of trade.

There are some portions of your letter to which I am instructed to reply, not because the Council admit their justice, but from an anxious desire on their part to stand well with the Royal Commissioners.

It will be to them a cause of deep regret should their deputation to the Royal Commissioners be found to have in any respect gone beyond their strictly defined instructions, so as to bind, either directly or by implication, the free action of the Council. The deputation of the Council, as they are informed, stated distinctly at their interview with the Royal Commissioners that their instructions were to learn, with as much accuracy as might be, the precise views of the Royal Commissioners with respect to the future disposal of their joint property, and to report the same to the Council.

In this report (of which I annex a copy) their instructions would seem to have been rigidly adhered to.

It is quite true, as stated in your letter, that nothing has been said in the various communications which have passed between the Royal Commissioners and this Society on the subject of compensation. The question would have been premature for discussion so long as it continued undecided to whom the ownership of the Trade Museum should ultimately belong. Indeed I am warranted in saying that several members of our Council anticipated, at the time the arrangement was entered into, that the Trade Museum would be left under the control of the Council, and exhibited on premises to be appropriated to the use of the Society of Arts, at Kensington Gore.

In asking the Royal Commissioners to reimburse the Society the money actually expended by the Council on the Trade Museum they would observe, that the Society of Arts, although founded upwards of a century ago, possesses neither endowments nor real property of any kind; that although it has expended since its institution upwards of £200,000 in the promotion of national objects and in the development of the arts, manufactures and commerce of the country and of the colonies, it has never yet received the grant of one shilling of the public money, and that its whole income is derived from the annual subscriptions of its members and of the 400 Institutions associated with it.

In illustration of these statements they would call attention to the fact, that although the Great Exhibition of 1851 was mainly due to the President and Council of this Society, and they undertook all the risk of so vast and doubtful an experiment, yet they cheerfully relinquished their claim to those profits which they might have insisted on under the original contract deeds, and that although the "Surplus Fund," after paying all expenses and satisfying claims of every kind, was, notwithstanding, very large, yet no portion whatever of that fund was appropriated for the Society of Arts, even though the justice of their claim was formally recognised by the Royal Commissioners.

Again, with respect to the Educational Exhibition of last year, although it taxed the energies of the Council to the utmost, and cost £1400 besides (of which £400 remains a permanent charge on the funds of the Society), yet it was transferred by the Council to her Majesty's Government without any claim for compensation, on the sole condition that it should be forthwith exhibited to the public, a pledge which the Government have not found themselves in a position hitherto to redeem.

The Council, however, rejoice to find that this state of things is no longer to continue, for the exhibition and development of the Educational Collection made by the Society of Arts is put forward as the very first ground on which the Royal Commissioners sought and obtained a grant of public money.

Under these circumstances it is hoped that the Royal Commissioners will realize the exact position of the Council, dealing as they have to do with the small contributions of a large number of persons and Institutions, and believe that they have the strongest desire still to be permitted to afford such aid as may be in their power to uphold and promote those important national objects for the development of which the Royal Commissioners have been constituted the legitimate organ.

I am further instructed to state, that the Council learn with much satisfaction the correct appreciation the Royal Commissioners have formed of the energy, ability, and knowledge of Professor Solly. They did not, however, expect to receive a formal pledge of his future appointment. They are satisfied that his own merits will weigh more with the Royal Commissioners than even the Council's recommendation.—I have, &c.

P. LE NEVE FOSTER, Secretary.

Enclosure (1) in the above Letter.

Resolutions passed by the Council of the Society of Arts.

Resolved,—That it appears by the books of the Society that the sum of £929 5s. 9d. has been expended in actual advances solely on behalf of the Trade Museum, exclusive of the expenses due to the use of apartments, coals, gas, stationery, the services of the officers of the Society, and the attendance of its servants.

Resolved,—That the Royal Commissioners having under the arrangement originally entered into, already paid £400 towards the formation of this Museum, on their undertaking to pay to the treasurers of this Society the sum of £529 5s. 9d., being the balance of the foregoing sum £929 5s. 9d., the property of the Society of Arts in the Trade Museum be made over to the Royal Commissioners, (excepting only such articles as belong to Professor Solly,) and that the Council do present to them, as a gift, those specimens of animal, vegetable, and mineral produce which exclusively belong to the Society.

(Signed) P. LE NEVE FOSTER, Secretary.

Enclosure No. 2 in the above Letter.

Minute of what took place at the Conference between the Royal Commissioners and a Deputation from the Council, &c.—(*See ante, page* 390, *column* 1.)

5.—H.M. Commissioners to the Society of Arts.

Whitehall, October 25th, 1855.

Sir,—I am directed by her Majesty's Commissioners for the Exhibition of 1851 to acknowledge the receipt of your letter of the 17th instant, submitting for the information of the Commissioners a copy of resolutions passed by the Council of the Society of Arts to the effect that they are prepared to transfer to the Commissioners, for the sum of £529 5s. 9d., their share of the Trade Museum recently exhibited in the rooms of the Society.

Her Majesty's Commissioners observe that the above amount represents the total sum that has been expended by the Society in connection with the formation of the museum in question; but as they have already, in their letter of the 4th August last, expressed their admission of the principle that the Society should receive from them, in consideration of the transfer of the collection, some reimbursement for the outlay it has incurred in connection with the formation of the museum, and as they left it to the Council to state the amount which under the circumstances detailed in that letter they would consider it right to receive as such reimbursement, it only remains for the Commissioners to state their acceptance of the terms set forth in your communication, and their readiness to pay the full amount of £529 5s. 9d. claimed by the Society, which sum they have accordingly instructed their financial officer to pay to you on the transfer to them of the collection, and its removal to its destination in the new museum building.

Her Majesty's Commissioners direct me to convey to the Council their thanks for the valuable suggestions offered by them as to the principles upon which the development of a Trade Museum worthy of this country should be made to depend.

In thus assuming the sole charge of this collection, the Royal Commissioners cannot omit this opportunity of again testifying to the high sense entertained by them of the cordial co-operation which they have at all times experienced from the Society, whether in connection with the objects of the Great Exhibition for which the Commission was originally appointed, or, as respects the development of the more extensive scheme originating with the existence of the Surplus Fund, for the execution of which they subsequently received powers from the Crown. Of this scheme the establishment of a permanent and increasing Trade Museum forms an important part; and from their experience of the efficacious assistance which they have already received from the Society of Arts in connection with its formation, her Majesty's Commissioners will gladly avail themselves of the offer of the Council expressed in your letter, to continue to afford such aid as may be in their power towards the promotion of the national objects which they have in view.

I have, &c., EDGAR A. BOWRING.

Home Correspondence.

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IRON INDUSTRY OF FRANCE.

Sir,—It not having suited the arrangements of your Society to carry out my suggestion relative to the reading of a paper on " The Iron Industry of Great Britain, with reference to that of other countries, as regards the cost of production and transit," I have, so far as lies in my power, from the materials I have at hand, arranged some account of the iron manufactures of France, a country, next to America, the most important, as regards this branch of industry, in connection with Great Britain. The information is derived principally—I may almost say entirely, as regards France—from the Report of his Excellency the Minister of Commerce, the " *Résumé des Travaux Statistiques de l'Administration des Mines*," in 1847, 1848, 1849, 1850, 1851, and 1852, and although the information is not brought down immediately to the present date, it nevertheless embraces a most important period, that of 1847, the year before the revolution of February, 1848, and the following years, thereby showing the effect this great event had for a time on the manufactures of France.

That the report does not come down later than 1852, is not of much consequence; the results produced show a gradual, and for the last year a decided advance, from the collapse, in the recovery of confidence, and it is still open for some one else to continue the subject from information to which I have not, at present, very ready access. I have not touched upon the nature of the minerals, nor upon the process of manufacture; these have been fully placed before your Society by Mr. Blackwell, in the paper he read—the particulars of which appeared in your journal of the 21st December and 11th January last. I treat the subject in its commercial point of view, and I have carefully avoided all French weights and money values, reducing the former to tons, and the latter to £ sterling, as more readily understood by those, who, in all probability, will feel the most interest in the information I wish to communicate.

Mines, and more particularly those of minerals connected with the manufacture of iron,—" *Ce précieux métal, qui sert tout à la fois aux œuvres de la paix et à celles de la guerre*,"—form an important part of the public riches, but as they are riches which exhaust without the power of renewal, it is most essential that the working of them should be carried out by the rules of art, so that no material should be left in the ground to waste, which it is not absolutely impossible to extract. From this motive, amongst others, the old monarchy of France considered that mines ought be classed amongst the dependencies of the royal domain—that the sovereign alone should give permission for the working of the mines. It was from this same motive that, after the abolition of the feudal rights, the mines were placed at the disposal of the nation by the law of the 28th July, 1791; and afterwards, under the Empire, by the law of the 21st April, 1810, it was declared, in accordance with the Code Napoleon, that the proprietorship of the mines was vested in the proprietorship of the land. It was, however, decided that the government had power, independent of these rights, to concede the mines to others than the proprietors of the soil, the sole condition being a quit-rent, or, as we should term it, a royalty, in favour of the latter. With the view to the proper working of the mines, the government, in making a concession, examines with the most scrupulous care, *la capacité morale, intellectuelle, et financière de ceux auxquels ils les concède, et qu'après la concession, donnée, il fait surveiller d'une manière continue, par ces ingénieurs, les opérations des concessionnaires*. Under this law 448 mines of coal had been conceded in 1847, spread over forty-five departments; of these concessions 258 were worked in 1847, which gradually increased, till in the year 1852 there were 286 mines in operation.

The following table shows the quantity of coal raised, imported, exported, and consumed, together with the average price at the mines:—

Years.	Raised.	Price.		Imported.	Exported.	Consumed.
	Tons.	s.	d.	Tons.	Tons.	Tons.
1847	5,078,850	8	1	2,511,945	52,284	7,735,620
1848	3,942,711	8	2	2,112,838	48,214	6,007,263
1849	3,990,793	8	2	2,359,408	37,146	6,313,057
1850	4,369,596	7	11	2,792,385	40,963	7,121,018
1851	4,420,320	7	9	2,884,353	34,278	7,270,391
1852	4,833,168	7	8	3,051,289	40,763	7,843,688

Of the quantity raised about one-sixth is anthracite, the average price 9s. 7d. per ton, the other descriptions of coal 7s. 8d. per ton.

The principal coal-basins are:—	Average quantity raised. Tons.
Loire	1,493,262
Valenciennes	1,025,050
Alais	342,327
Creusot and Blanzy	339,650
Aubin	144,177
Commentry	182,738
Epinac	83,132
Maine	94,221
Aix	99,881
Other basins, of which there are 53	634,802
Total annual average	4,439,240

Taking the years 1847 and 1850, the average price at the mine in 1847 was 8s. 1d. per ton, and at the place of consumption it was about 17s. 3d. per ton—more than double the cost. In 1850 it was at the mine 7s. 11d., and at the place of consumption 16s. 3d.; this reduction, though slight, is attributed to the gradual improvement in the interior communications. But in certain districts, as in half the departments of the Loire, they paid four, five, and even six times the average price at the mine.

The importation during the same period was, on the average, from

	Tons.
Belgium	1,770,094
Great Britain	579,944
Rhenish Provinces	267,398
Other Countries	1,264
Total annual average	2,618,700

As peat has a considerable consumption, it may be as well to state that the annual average quantity raised was 468,395 tons, average price 7s. 7d. per ton.

With regard to the ironstone, France is very rich in the minerals of iron, but, with some exceptions, they are found at places distant from the coal, and as the cost of the iron depends upon the price of the fuel, it is easy to understand that this is one of the principal causes why France is behind other countries, and of Great Britain in particular.

The quantity of ironstone raised in the year 1847 was 3,413,718 tons, the price at the mine being 2s. 2d. per ton. In 1848, a year of disturbance, the quantity was not taken, but it was considered to be about equal to the average of the two following years.

		Price.
1849	1,740,913	2s. 9d.
1850	1,794,892	2 10
1851	1,748,771	2 11
1852	2,050,612	3 0

Thus, by the crisis of February, 1848, the production, and consequently the consumption of ironstone, was diminished one-half, and the mean price was raised, a natural consequence when it is considered that the preparations in 1847 " *que nous prenons pour une année normale*," were made for a regular consumption, and when the demand decreased the general expenses necessarily increased.

The departments yielding the greatest quantity of ironstone, were Haute-Marne, Haute-Saône, Cher, Moselle, and Nord, the quantity raised being:—

		Average of each Department.
	Tons.	Tons.
1847......	1,855,792	371,158
1849......	960,838	192,168
1850......	1,025,082	205,016
1851......	945,026	189,005
1852......	1,103,574	220,715

After these came the departments of Ardennes, Meuse, Côte d'Or, Pas de Calais, Nièvre, Aveyron:—

		Average of each Department.
	Tons.	Tons.
1847......	805,330	134.222
1849......	405,709	67,618
1850......	396,958	66,160
1851......	445,403	74,234
1852......	572,744	95,457

Of the other departments it will not be necessary to speak, as the quantities raised were comparatively small.

In twenty-six departments they consume their own minerals, and amongst them the Nord, Meuse, and Aveyron. These appear amongst those departments in which the ironstone raised is the most abundant. But, if they do not send away their minerals it is, as regards the Nord, not only because there are many iron works, but the price of the mine is high, and will not bear the expense of long transport; a similar reason will apply to Aveyron, and here also because the means of transport are easy, and of light cost, with the departments which immediately surround it. For the Meuse, because the number of furnaces is equal to the consumption of all that is raised; and by the law of 1810 the produce of the mines is to be appropriated, in preference, to the works in the neighbourhood.

In localities where the mine is rich, and of a superior quality, and where it is raised at little cost, it is often sent to considerable distances. Thus, the mine of Haute-Marne is dispatched into three departments—those of the Côte d'Or, Meuse, and the Vosges. The mine of Haute-Saône is sent into five departments—the Côte d'Or, Doubs, Jura, Isère, and Saône-et-Loire. The Cher supplies, independent of the works in the neighbourhood, those of four departments—Allier, Indre, Nièvre, and Saône-et-Loire. The mine of the Moselle is sent to the Ardennes, Meuse, and even to Prussia. Then there are certain departments—Ardèche and Ariège, for example—which produce an iron ore of a very superior quality, so that the price is somewhat higher; this ore is supplied to many departments.

It may be remarked as regards the iron mines that, independent of 177 government concessions, which extend over thirty departments, there exist in the empire a considerable number of mines, which, in accordance with the terms of the law, are dependent on the proprietors of the land; and it is only in default of their working these mines themselves, that the government may give to the iron-masters in the neighbourhood authority to work them for the use of their works. There is a somewhat similar custom to this in the Isle of Man, with respect to the working of a quarry, which, should the working be discontinued, after it has been opened by the proprietor, may be worked by others at their own cost.

In all cases a royalty is reserved to the landlord, which, taking the year 1847, amounted to nearly one-fourth of the value of the mine raised, or about 6d. per ton—thus raising the cost to 2s. 8d. per ton. This price does not represent the value of the ironstone as ready for the furnace, because it is always mixed with earth or other extraneous matter, to get rid of which it has to be washed or calcined, and this adds considerably to the cost. Taking the year 1849, it appears that in the preparation of the mineral raised in thirty-four departments, and upon a total quantity of 1,187,636 tons,—about two-thirds of the whole quantity raised,—that it was reduced by washing to 524,964 tons, or less than half the original quantity. The operation cost about 5 per cent. on the price of the ironstone. The mineral, therefore, which has been prepared for the furnace is but 1,078,240 tons, at an average value of about 5s. per ton. This sum has still further to be raised to represent the price at the works—the cost of transport having to be added. This expense is naturally very variable, according to the distance it has to be conveyed. Upon a calculation made of these expenses in the year 1847, and adding them to the above average cost, it makes the price at the furnace about 7s. 2d. per ton.

Taking the total quantity of ironstone raised, it averages 4 tons 12 cwts. to the ton of pig iron.

From the prolonged depression which attended the revolution of 1848, and seriously affected the iron works, they are gradually recovering.

In France, the principal fuel employed in the furnaces is charcoal. The pig iron thus produced is dearer than that made with coal, but it is of better quality, and fetches a higher price. The Minister, in his Report, observes:—"*Ce mode de fabrication ouvre d'ailleurs un débouché précieux au bois de nos forêts, et il serait désirable, sous ce rapport, qu'il se maintînt, lors même qu'il serait possible aux maîtres de forges de se procurer dans de bonnes conditions tout le combustible minéral dont ils auraient besoin.*"

The following tables show the quantity of pig iron made with charcoal and with coke; also the make of bar iron with charcoal and with coal, and the average prices:—

Year.	Pig Iron Charcoal.	Price.			Pig Iron Coke.	Price.			
	Tons.	£	s.	d.	Tons.	£	s.	d.	Total Tons
1847	334,535	8	2	0	248,519	6	4	7	583,054
1848	278,258	6	5	9	187,368	5	4	3	465,626
1849	247,703	5	19	0	160,516	5	0	6	408,219
1850	226,208	5	17	10	173,592	4	14	3	399,800
1851	243,543	6	3	2	195,833	4	13	9	439,376
1852	259,540	6	11	7	255,562	5	1	0	515,102

Year.	Bar Iron Charcoal.	Price.			Bar Iron Coal.	Price.			
	Tons.	£	s.	d.	Tons.	£	s.	d.	Total Tons
1847	93,173	20	14	4	278,079	14	1	2	371,252
1848	69,896	16	6	8	202,371	12	2	5	272,267
1849	66,232	15	7	0	173,708	11	2	5	239,940
1850	67,114	14	19	4	175,529	9	19	5	242,643
1851	74,822	15	0	7	175,677	10	15	9	250,499
1852	63,670	17	3	0	233,779	10	19	0	297,449

Of the reduction of make since 1847, the most remarkable is that of the department of the Gard, which, after producing 15,057 tons of bar iron with coal in 1847, manufactured only 2,690 tons in 1849; Nord, 1847, 55,214 tons, in 1850, 22,484 tons; Soâne-et-Loire, 20,204 tons, reduced to 10,053 tons; and Aveyron, 20,697 tons, to 4,628 tons.

The reduction in other districts, as Moselle and Côte d'Or, would have been still more considerable, if it had not been that, at the time of the revolution, they had large contracts for rails for the Lyons and Strasbourg railroads, which kept them employed during the crisis. Forty-seven departments manufactured pig iron with charcoal during the period under consideration, the principal of which, in the year 1847, "*la seule que l'on puisse regarder comme normale,*" were the following:—

	Tons.		Tons.
Haute-Marne	66,526	Nièvre	18,116
Côte d'Or	34,090	Meuse	16,704
Haute-Saône	33,195	Cher......................	16,344
Moselle	20,487	Dordogne	11,737
Ardennes................	20,007		

The other departments varied from about 8,000 tons to less than 2,000 tons. In twenty-three departments, they manufactured pig iron with coke, of which the principal were:—

	Tons.		Tons.
Moselle	38,272	Cher	21,340
Nord	27,168	Ardèche	21,238
Gard	25,173	Allier	15,750
Aveyron	23,604	Pas de Calais	15,572
Saône-et-Loire	21,537	Loire	11,262

With respect to the foundries, the amount of castings from remelted iron, besides those run directly from the blast furnaces, was, in

	Tons.	Price per Ton.
1847	108,066	£15 15s. 7d.
1848	69,072	14 3 8
1849	58,680	13 10 4
1850	70,267	12 17 6
1851	81,039	12 15 7
1852	88,800	12 18 2

Another, a new and important manufacture, has yet to be noticed—that of rails. In the departments of the Nord, Aveyron, and Gard, the manufacture of rails was principally carried on in the year 1847; in the years 1848 and 1849, the Nord still held the first place; but in 1850, 1851, and 1852, the make was exceeded by that of Moselle, which, in 1847, had held only the seventh place. The price of rails was well maintained, under the influence of unexecuted contracts, till 1852, when the price fell to that of bar iron. The make of rails was, in

	Tons.	Price per Ton.
1847	87,466	£13 11s. 2d.
1848	71,784	12 8 7
1849	40,648	12 8 7
1850	22,754	12 5 2
1851	26,716	12 7 7
1852	59,590	10 17 7

The quantity of charcoal consumed in the manufacture of pig and bar iron, in the years 1847 to 1852 inclusive, was, on an average, 521,806 tons, at a cost of £2 12s. 9d. per ton.

It took 1·415, or about 1 ton 8 cwt. of charcoal to a ton of pigs, at a cost upon the ton of pigs of £4 12s. 7d. in 1847; £3 5s. 2d. in 1850; and £3 7s. 2d. in 1852. To a ton of bar iron 1·90, or 1 ton 18 cwt. at a cost of about £4 19s. to a ton of bars. The average quantity of coke to a ton of pigs was 1·85, or 1 ton 17 cwt., at a cost of 19s. 3d. per ton, or about £1 16s. per ton of pigs.

Mr. G. R. Porter in his "Statistical View of the Recent Progress and Present Amount of Mining Industry in France," (1836) of which I made considerable use in my work on the iron trade—states, that the average prices of fuel in 1836 were, for charcoal, 54s. 10d. per ton; coke, 20s. 3d. per ton; coal, 18s. 5d. per ton.

The cost of Charcoal per ton of pigs	£4	0s.	6d.
,, of Coke ,,	1	16	2
,, of Charcoal Pig Iron	8	10	4
,, of Coke ,,	4	10	4

Deducting from the value of the metal the sum expended for fuel, there would remain when charcoal is used, £4 9s. 10d. per ton; when coke is used, £2 14s. 2d. per ton.

The regular return of the make of iron in France, commenced in the year 1824. The make was, in

	Pig Iron. Tons.	Bar Iron. Tons.
1824	194,636	139,564
1836	303,739	201,691
1847	583,054	371,252
1852	515,102	297,449

Having thus endeavoured to show the progress of the manufacture in France, I will now, as briefly as possible, refer to our own manufacture as compared with that of France, keeping as closely as possible to the same periods of time.

In 1825, the make of pig iron in Great Britain was 581,367 tons; France, 195,588 tons; in 1836, France 303,739 tons.

I have not got the make of pig iron in Great Britain in the year 1836; but Mr. Mushet, in his papers on "Iron and Steel," states that in 1839, it was 1,248,781 tons; 1847, Great Britain, 1,999,608 tons; France, 583,054 tons; 1852, Great Britain, 2,701,000 tons; France, 515,102 tons.

The price of English bar iron, at the shipping ports in Wales, was, in January, 1825, £12 10s. In France, according to M. Hiron de Villefosse, £26 10s. per ton.

	Average in the year.				
1836	£10 2 6	France uncertain.			
1847	8 12 6	France—charcoal, bar	£20	14	4
		coal	14	1	2
1852	5 10 0	charcoal	17	3	0
		coal	10	19	0

France has not hitherto been a customer to any great extent for our iron, except in 1855, but of this I have not the particulars.

Our exports to France of all descriptions of iron were—

Year.	Pig Iron.	Bar and other descriptions.	Total.
	Tons.	Tons.	Tons.
1825	......	......	3,273
1836	......	......	14,422
1852	20,195	2,623	22,818
1853	31,830	3,175	35,005
1854	33,512	9,722	43,234

On the 1st of January, 1855, the New French Tariff came into operation.

Duty on pig iron	£1	15	4	per ton.
Bar, according to dimensions, from	4	8	0	
to	6	3	4	
Iron plates	8	16	0	
Steel, in bars, cast and wrought	13	4	0	
Rails, the same as bars, according to dimensions				

In 1855, the total imports into France were—

Pig iron	134,078 tons.
Bar	70,760
Together	204,838 tons.

But the returns are not yet published of the proportion of British iron included in this amount.

The general exports of British iron and steel, during the years 1853, 1854, and 1855, were—

EXPORTS.	1853.		1854.		1855.	
	Tons.	Declared value.	Tons.	Declared value.	Tons.	Declared value.
Pig Iron	333,585	£1,056,310	293,432	£1,244,853	293,584	£1,080,108
Bar and all other descriptions	907,399	9,106,979	882,448	9,747,970	786,017	7,807,604
Steel, unwrought	20,288	682,133	20,793	681,852	16,678	585,174
Tons	1,261,272	£10,845,422	1,196,673	£11,674,675	1,096,279	£9,472,886
Hardwares and Cutlery		3,665,051	....	3,868,498	....	2,960,391
Machinery and Mill Work, Steam Engines, and parts of Steam Engines		458,376	....	566,768	....	877,924
All other sorts		1,527,160	....	1,364,092	....	1,333,291
Total declared value		£16,496,009	....	£17,474,033	....	£14,644,492

Imports and Exports of Foreign Iron and Steel.

	Imports.			Exports.		
	1853.	1854.	1855.	1853.	1854.	1855.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Iron in bars, unwrought,	47,776...	41,745...	37,407	5,458...	4,341...	3,173
Steel, unwrought	1,362...	1,409...	971	1,171...	1,340...	1,185

It is to be observed that the returns for the years 1853 and 1854, are made up to the 5th of January; those for the year 1855, to the 31st December.

The advantages we possess in our iron districts over other countries are frequently mentioned. It is said, in general terms, that our materials are all found together—the coal, the ironstone, and the limestone, which, with our clay ores, is an essential, but I do not recollect to have seen any precise description of these advantages. I shall, therefore, conclude my letter by giving some account of one of our mineral fields. The property I speak of, consisting of many hundred acres, is situated in South Wales, and the iron made at the works is of very good quality. I select a South Wales work because I consider it presents a fair medium, as regards cost, between the cheap manufacture of Scotland, and the dearer manufacture of South Staffordshire.

Sinking a pit through the minerals of this property you have, within a depth of about 160 yards,

Seven veins of coal, varying from 5 feet 6 inches in thickness to 3 feet, having an average thickness of about 4 feet. These veins have been calculated to yield 24,000 tons per acre.

Six veins of ironstone, calculated to yield 9,500 tons per acre.

At some distance below these is the limestone, which crops out about three miles from the works, and is inexhaustible in quantity.

There is also excellent fire clay.

In the following statement of the cost of the manufacture of iron, it is not my object to give a profit and loss account, but merely an approximation to an actual result:—

Coal.—Cost at the Mine.

	s.	d.
Labour per ton	3	7
Stores, pitwood, &c..	0	5
Per ton	4	0

Ironstone.—Cost at the Mine.

Labour	7	2
Stores, pitwood, &c..............................	0	10
Per ton	8	0

Limestone.—Cost at the Rock.

Labour	1	5
Stores..	0	3
Per ton	1	8

Furnaces.—Cost at the Works.

	£	s.	d.
Labour..	0	7	6
Coal, 3 tons 8 cwt., at 5s.	0	17	0
Ironstone, 3 tons 7 cwt., at 9s. 3d.	1	11	0
Limestone, 1 ton 2 cwt., at 2s. 6d.	0	2	9
General charges	0	2	6
Per ton of pig iron	3	0	9

Refinery.—Cost at the Works.

Labour..	0	2	9
Pig iron, 1 ton 2 cwt., 3 qrs., at £3 1s. 0d.	3	9	4
Coal, 10 cwt. 2 qrs., at 5s.	0	2	7
Per ton of refined metal...	3	14	8

Puddling Forge.

Labour	0	11	2
Refined metal, 9 cwt. 2 qrs., at £3 15s. 0d.	1	15	8
Pig iron, 11 cwt. 3 qrs., at £3 1s. 0d.	1	15	10
Coal, 1 ton 2 cwt. 2 qrs., at 5s.	0	5	8
Per ton of puddled bars...	4	8	4

Rolling Mill.

Labour..	0	9	9
Puddled bars, 1 ton 2 cwt. 2 qrs., at £4 9s. 0d.	5	0	2
Coal, 1 ton 2 cwt. 2 qrs., at 5s.	0	5	8
General charges	0	5	0
Per ton of bars	6	0	7

The above costs are calculated on what is termed "Long Weight," 2,400lbs. to the ton; on this weight wages are paid, but the iron is sold at what is called "Short Weight," 2,240lbs. to the ton.

The cost of the selling weight, therefore, of pig iron, would be £2 16s. 6d. per ton, and of bars, £5 12s. 6d. per ton—to which must be added, say 5s. per ton, for conveyance to the shipping port.

The cost of manufacture, of course, varies according to the rate of wages; but these are influenced by a rise or fall in the price of iron. Our wages at the mines are calculated upon the ton. The French at their coal mines pay by the day, the average rate of which, in the whole period embraced in the report, is 1s. 8d. per day; or, taking it upon the quantity of coal raised, it amounts to double that sum; it is 3s. 4d. per ton.

The ironstone getters are employed by the year; the average amount of labour per ton of ironstone is 1s. 6d.

The great advantage the French ironmasters have, is that they are not subject to those outbreaks—*strikes*, they are called—which are too frequent in our works—outbreaks, which, although they materially affect the interests of the masters, in a still greater degree inflict a serious and lasting injury on the workmen and their families.

Yours faithfully,
HARRY SCRIVENOR.

Ramsey, Isle of Man,
April 9, 1856.

TEST OF STEEL MANUFACTURES.

Sir,—Your correspondent Mr. Wilson is a precisian. He fastens on me the *argumentum ad hominem*—defies me at "sharps"—seeks to impale me on the points of a trident. Choose from three undistinguishable blades, as Portia's lover from the three closed caskets. And if I fail to distinguish, he will pronounce me uneducated. So we must begin at the beginning—What is education?—and first, as to education in cutlery.

The agricultural mind, as exemplified in Hodge of old, purchased twelve razors for eighteen-pence. It was a lesson to him; and when his son came to the shaving age Hodge thus addressed him:—

> "My son, you need a razor—a good one—a razor that will cut, and not twelve razors that will not cut. This one razor will last you a lifetime, and the cost for a good razor over a bad one is the merest possible trifle compared with the length of time, and the loss of time involved in a low-priced bad investment."
>
> "But, father Hodge, I cannot distinguish between a good razor and a bad one."
>
> "Then, make proof, my son. Go to the cutler and bargain for a razor on trial—sale or return. If one cutler demurs to this, set him down as a relative of the Jew who sold me yon tin twelve for eighteen-pence, and go on to his neighbour, and so on until you find one willing to submit to this reasonable verification, paying him at the rate he demands. Thus, my son, you will settle one life-long business. The razor may have two defects in its quality. It may be so brittle as to break away the edge in use; or so soft as to become dull on the edge.

These are two things which you, my son, if skilful enough to shave yourself, may verify in use. If you are not skilful enough to shave yourself, you must not use personal razors, but must pay an extra price for the verification of general razors by the barber. Whatever tools you *use*, my son, you can find out the merits of in use, whether ploughshare, axe, spade, shovel, pitchfork, dung-fork, or razor; and if you have not the faculty to judge by eye or feel, be sure you never buy but by trial. Deal with the maker who will guarantee, and change them if found to fail. And so, my son, with all things you may require through life, whether shoes, shirts, clothing, or other matters. Cheshire cheese, my son, bacon, bread, beer, and provisions generally, you may verify by smell, and taste, and sight; and, to say the truth, I have ever found in you great precocity of intellect in these little matters from the time your first dream of Paradise was 'swingin' on a yett to eat fat bacon all day long;' and you trolled your happy chant—

> 'Of all the delights that are under the sun,
> Is to sit in the cellar and see the cask run,
> With a new roll and a Cheshire cheese.'

This, my son, is education. It will not make you an adept in razor-making, but it will insure you one or more good razors through your whole lifetime. And if all the boys of your school will get by heart what I have now said to you, my life on it, they will never be taken-in in razors, knives, or any other tools. If indeed they be in too great a hurry to verify it—if they think to cheat somebody by getting a knife or razor for half its value, they will infallibly be punished, as I was, my son, when, one after the other, the twelve razors pulled my beard out by the roots."

Now with regard to Mr. Wilson's three blades. I may or may not understand how to choose from them. If I do not, I shall say to Mr. Wilson, "Do you select for me, and charge me your price—not for pearl handles of price—not for Mr. Mappin's many-bladed *tour de force*—not for the tawdry adornments of bowie knives or "Arkansas toothpicks," the foppery of murder—but for an honest blade that will cut and endure."

If I do understand how to verify, I may do it for myself. I put the blade under a microscope, and if it be soft the polish will present a congeries of lines on the surface analogous to a surface of felspar that has undergone fusion without subsequent polishing. If high polish exist, and no lines but in the direction of the revolution of the polishing tool, it may, nevertheless, be too hard. If I put a cylinder of whalebone or horn into a lathe in rapid motion, and hold a brittle edge to it, it will break away; if a soft edge, it will blunt; if of the right temper and metal, it will cut. There is nothing in whalebone or horn to *grind* an edge to bluntness, and therefore a good blade should continue to cut for a considerable time. I am aware that telling this to Mr. Wilson is like "carrying coals to Newcastle." He, doubtless, can point out twenty tests, and if he would instruct customers how to apply them, the vendors of cutting rubbish would be nonplussed, as are mock jewellers by the application of strong acid to their mock gold chains. Testing all the things in common use, might surely be made a basis of common education—"knowledge of common things." It is simple laziness or ostentation that for the most part gets taken in, buying things for show and not for use.

But from the earliest times there has been occasional dubiety in Sheffield as in other wares. Historical records exist from the earliest times. In the old ballad of "Robin Hood and Guy of Gisborne"—

> "Robin pulled forth an Irish kniffe,
> And nicked his Guy in the face.

* * * *

> Robin pulled forth an Irish kniffe,
> And losed John hand and foote."

Why *Irish* knife? Tell us that, my masters, Master Cutler inclusive! Why, but that the "Whittler of Rivelyn" was an inferior craftsman to the Shawn-a gow who made skean or skenes for the Hernes and Gallowglasses outside the Irish Pale. Robin, jolly Robin, the King of Goodfellows, would never have left his neighbour craftsman to deal with the stranger, could he have been as well supplied at home with the tool to brittle a "hart of Greece." It was not price that influenced him, for he came easily by his coin, from bishops and others, and it could only have been quality.

Sheffield has long been famed for the fabrication of steel, but not indigenous metal. From the land of the Northmen has been brought the iron that has gained the celebrity of Sheffield. The port of Hull is the nearest haven between Swedish and Norwegian foundries and the Sheffield coal-pits. I am not aware that Sheffield was ever famed for sword cutlery, nor is there any reason save habit and custom, and the aggregation of workmen, why cutlery should be made in Sheffield in preference to Birmingham or other places. Toledo was famed of old for its marvellous sword-blades, and Andrea of Ferrara probably made his blades of Milan steel. Damascus in the East, and Solingen in the West, have been equally famous for swords of different qualities. From the earliest times perfect swords have been regarded with a kind of reverence, and feats of dexterity have been executed with them, from dividing a floating silken scarf down to the modern leg-of-mutton trick. There is probably no severer test of excellence than a thoroughly hardened, well-tempered, accurately-tempered sword-blade, and there is little doubt that at this time no country in the world produces more perfect sword-blades than England. One of the most interesting papers that could be produced would be a complete history of the sword, accompanied by specimens of all its varieties from the earliest ages down to the present date. The excellence has been caused by the demand of individuals rather than by the supply in the masses. No price could be too great for the weapon wherewith a man guarded his own life. CHALYBS.

REMARKS ON MR. G. F. WILSON'S AND MR. HAWES'S THEORY OF SAPONIFICATION.

Sir,—I have read with considerable interest the paper of Mr. Wilson, read January 23, on Candles, and that of Mr. Hawes, of March 28, on Saponification. These gentlemen differ upon a point of great importance, viz., the origin of glycerine. Mr. Donald Campbell, in the conversation of the last evening, says:—

"As a chemist, he differed materially from Mr. Hawes in the statement with respect to glycerine—namely, that a portion of the fatty matter, during the process of saponification, was converted into this substance, and that it did not exist originally in the fatty matter employed, and he might say that all scientific experiments hitherto were against that view." The object we all have at heart is the discovery of truth; this motive alone induces me to draw upon the patience and kindness of the Society, and ask the reception of their attention to my most humble observations on the subject of glycerine.

I informed Mr. George Wilson, three years ago, when experimenting with him at his laboratory at **Vauxhall**, that I had reason to believe that glycerine was an artificial product, arising from new atomic molecular arrangements, produced by chemical action upon fats, oil, or grease, during saponification; whether acid or alkaline. Mr. Wilson held the contrary opinion. I wish to avoid all hypothesis, and, therefore, beg permission to state circumstances and facts, that may, perhaps, give this question a better chance of solution than any correspondence or conversation will probably obtain.

I have converted one pound of tallow, and on another occasion two pounds of palm oil, into glycerine, and will engage to do so at any time; any fatty matter from the animal or vegetable kingdom can be *wholly* converted into soluble glycerine—of course I do not undertake to operate upon Ol Ricini, or a drying oil, such as linseed oil, &c., or rosin oil. I have operated upon glycerine, made by myself, and that sold; and have converted it into retro-glycerine—that is to say, a *most perfect oil*—such as may, probably, be produced by Mons. Bertholet, but whose process I do not use. Now, sir,—suppose two soap-makers, or two candle-makers, having different processes. A shall produce, through the want of chemical knowledge, 20 per cent. of glycerine, while B, by a better process, only produces 2 or 3 per cent. of glycerine, it will be evident that the amount of stearine, or soap, produced by B will exceed that produced by A.

I have tried every means of ascertaining if there exists any affinity between pure glycerine and pure stearine and oleine, and find none to exist; in fact, a more absolute chemical repulsion of the atoms of these substances cannot be imagined—it is as north and south, in fact—then how does nature, or the divine architect of nature, unite glycerine with fats and oils? If, as Mr. Wilson stated to me, glycerine is the link, or means of union between these two different fatty matters (*i. e.* the solid and fluid parts), here is a condition or case of chemical affinity about as philosophical as the celebrated battle and its results between the two Kilkenny cats, the details of which I need not repeat. Mr. Hawes, at any rate, has done good service—he gives chemical illustration and commercial results. It is far beyond £180,000 per annum that is sacrificed to the shrine of rule of thumb; the ignorance and stupidity of some of the trade deserve the punishment they inflict upon themselves, except that, unfortunately, it falls ultimately upon the public as the consumer.

Yours, &c.

H. C. JENNINGS, M.D.

N.B.—Retro-Glycerine has most extraordinary properties, which will, probably, place it among the truly wonderful products of creative chemistry—its volume of latent heat is perfectly astonishing.

8, Great Tower-street, 14th April, 1856.

INTERNATIONAL PATENT RIGHT.

Sir,—In order to come to any clear understanding on the subject of International Patent Right, it would be necessary first to assimilate the patent laws in all countries entering into the arrangement. An inventor should then be entitled to take a patent in each country, or a protection in each country, simultaneously, being at liberty to abandon, if seeing fit. He could then negotiate in any or all. If, in the meantime, any similar specification had been lodged by a native, his right of abandoning it should revert to that person. But then comes the question, should the fact of the invention being in use in one country, disable any *bona fide* inventor from patenting in any other? I do not think it just that the first discoverer, who has patented it, or used it only in his own country, should prevent any other *bona fide* inventor from patenting and using it in any other country. It would be unjust that the foreign patentee should keep a home patentee in uncertainty for a longer period than the protection clause; and I doubt whether a patent all over the world at once would be useful to the inventor. It would be after the style of land-buying in the wilderness—a property not useful—because it would be very difficult to work. And I think it quite right to leave to our colonial governments the right of dealing each with their own patent laws. Practically, foreign patents are frequently taken and abandoned without usufruct, the patentee having no time to attend to them. But I do not agree with the governments who stipulate for a forfeiture if the patent be not put into use in two or three years; the far better plan is to keep up annual payments, for the patent is useful to the public, by the inducement it holds out to the individual to work at it, and introduce it; and an annual tax, possibly, in increasing ratio, will deter him from keeping it without use.

The fact is, that some patents are allowed to run out, because measures have not been taken to work them in time. A patent, like the "act" of the grammarians, has several branches—the invention, the provisional specification, the complete specification, the working out in practice, and the putting into business. At this time I have lying by me matured plans for many improvements in the great branches of manufacturing industry, which remain unpatented simply because I have not encountered the men with the conjoined perceptive enterprise and capital, and, I may add, good faith, essential to the promotion of my plans. In former years I advocated the giving such things gratuitously to the public, but I know by experience that, were I to publish them in your pages, the very publishing would ensure their not getting into use, because no one would put a thing into work on the terms of unfair competition. I know that they are original, for I have verified them from the patent list. I know they are valuable and useful, for they supply public wants, but they lie perdu, and will continue so to do till I find the men to supply the other side of the question, and as I have only once or twice, on a tolerably wide range of subjects, found myself forestalled, I feel, on the doctrine of averages, very little of that nervous anxiety said to be the normal condition of inventors.

At the present time some foreign governments grant privileges to English inventors of taking out patent duplicates of their English patent, at any time, but not permitting their own citizens to do the same. Abhorring the piratical principle of filching patents, still it is not for the advantage of a country that a foreigner should hold a right which he does not exercise without payment, deterring the native citizens from working at the improvement. To give three years' protection, as proposed by Mr. Tolhausen, without allowing any native subsequently to patent it, would be an evil, for no one would be interested in commencing a new process without protection. I think that French citizens are damaged by this process, although I, as a French patentee, may profit by it.

There is one obvious difficulty in internationalising. Inventors in one country cannot tell what is possibly doing in the other countries, and there would be continual clashing. It would be very hard for an English inventor, taking a patent on the 1st of May, to be told that it was void by means of a French patent for the same thing, taken April 30, and *vice versa*. Meanwhile, there is the one thing needful above all—the tribunal which shall try gratuitously the legal questions besetting patentees—the officers being paid out of the surplus Patent Funds. Till this be done—it is a mere mockery of right and justice to pretend to grant patents at all.

I am, Sir, yours faithfully,

W. BRIDGES ADAMS.

P.S.—I observe that Mr. Hawes, in his paper on Soap Manufacture, dwells upon the mischief of the exciseman stealing the secrets of a manufacturer to sell them to the trade. Mr. Hawes thus likes monopoly, with the only difference of keeping it secret, instead of making it patent; but the secret would not be appreciated by the trade if it were only a theory and not a practice. The word *theory*, in trade translation, means an impracticable or unpractised thing. Material fact is the only evidence constituting trade value; and if an inventor, not desirous of gain, wished to introduce a new plan, his best mode would probably be to communicate secretly to some unscrupulous sharp man of business his intention of patenting it and working it with some rival manufacturer. The sharp man would then, probably, put it in the patent list as "a communication from some foreigner residing abroad."

Proceedings of Institutions.

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Salford.—On Friday evening, the 11th inst., the pupils of the Mechanics' Institution Day and Evening Schools were publicly examined, and a distribution of prizes took place, for which the necessary funds had been provided by Mr. E. R. Langworthy, the president, who occupied the chair on this occasion. On the platform with him were Mr. D. Chadwick, the treasurer, and Mr. Urquhart, the hon. sec. There were also on the platform about 70 boys, and between 20 and 30 girls, the subjects for examination. They were selected from the day schools, in which there are 100 boys and 30 girls, and from the evening classes, which are thus attended:—Writing, 73; arithmetic, 74; grammar, 67; drawing, 6; French, 6; mathematics, 8; singing, 6; writing, &c. (female), 25.—Mr. John Angell, the master of the boys' school, commenced the examination with a lesson on social economy, in which each question and answer formed a distinct logical step in the chain of reasoning proving a given proposition. The girls were then examined in geography and grammar, by their teacher, Miss Agnes Miller, and in arithmetic, by Mr. Chadwick. Mr. Angell further examined his boys in fractional arithmetic and grammatical analysis; and the examination concluded with a lesson on human physiology, conducted by means of a human skeleton and diagrams. The examination throughout was most satisfactory, and the intelligence and readiness of the replies elicited much approbation. The prizes were then distributed to the more deserving pupils, of whom the following is a list:—Day Schools—John Corns, William Bogg, Thomas Rowlands, James Ashton, Francis Henstock, George E. Tunncliffe; Miss Tickell, Miss E. Gilman, and Miss Brassington. Evening Classes—Grammar, John Roberts, George Teasdale; drawing, James Hamer and Alexander Braid; arithmetic, James Shephard and William Parker; writing, Richard Hulme and Thomas Foster; music, John Royle; female class, Miss Bell, Miss E. Robinson, and Miss F. Gill. A vote of thanks to the president terminated the proceedings. The directors, it is understood, entertain hopes of some of the pupils competing at the Society of Arts examinations in June next; and are, it is said, prepared to contribute towards the expenses of deserving candidates.

MEETINGS FOR THE ENSUING WEEK.

Mon. Royal Inst., 3, Professor Huxley, "On Physiology and Comparative Anatomy."
London Inst., 7, Dr. Lankester, "On the Recent Progress of Vegetable Physiology."
Actuaries, 7, Mr. Peter Gray, "On a Theoretical Table of Mortality, proposed by the late Mr. W. Orchard."
Architects, 8, Mr. J. Clayton, "On the Bridges and Viaducts of the Present Day."
Geographical, 8½, 1. Capt. C. Irminger, "Reasons for Doubting the Existence of an Arctic Current along the East Coast of Greenland;" 2. Capt. M. Quin, R.N., "Note on the Bonin Islands;" 3. Messrs. Kelley, Kennish, Serrell, and Stone, "Reports on the Connection between the Atlantic and Pacific Oceans, *via* the Atrato River."

Tues. Zoological, 1, Anniversary.
Royal Inst., 3, Mr. T. A. Malone, "On Photography."
Civil Engineers, 8, Discussion upon Mr. Kelley's paper, "On the Junction of the Atlantic and Pacific Oceans, by a Ship Canal through the Valley of the Atrato."

Wed. Royal Inst., 3, Prof. Tyndall, "On Light."
Society of Arts, 8, Mr. Joseph Burch, "On the Printing of Fabrics, with special reference to Shawls and Carpets."
Microscopical, 8.

Thurs. Royal Inst., 2, General Annual Meeting.
Antiquaries, 8.
Photographic, 8.

Fri. Botanical, 8.
Royal Inst., 8½, Professor Owen, "On Ruminant Animals and the Aboriginal Cattle of Britain."

Sat. Royal Inst., 3, "Dr. Hofmann, "On the Non-Metallic Elements, their Manufacture and Application."
Royal Botanic, 3¾.
Medical, 8.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 17*th April*, 1856.

Par. No.
93 (1). Harbours, &c.—Report of the Board of Trade.
149. Iron Ordnance—Return.
152. Committee of Selection—5th Report.
158. University of Quebec—Copy of the Charter.
98. Bill—Cambridge University (Amended).

Delivered on 18*th April*, 1856.

99 (7). Civil Service Estimates—Class 7.
151. Mortars—Correspondence.
157. Mortars and Guns—Copies of Agreement, &c., with Messrs. Grissell and Co.
124. Ordnance Departments, &c.—Return.
150. Disembodied Militia—Return.

Delivered on 19*th and* 21*st April*, 1856.

134. Sherburn Hospital—Copies of Correspondence, &c.
146. Cemeteries (Metropolis)—Copies of Reports.
154. Malt—Account.
161. Railway and Canal Bills Committee—2nd Report.
99. Bills—Maynooth College.
100. Bills—Lunatic Asylums (Ireland).
101. Bills—Bleaching, &c., Works.
Exhibition of 1851—3rd Report of the Commissioners.
Chancery Commission—3rd Report.

PATENT LAW AMENDMENT ACT, 1852.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette April* 18*th*, 1856.]

Dated 21*st January*, 1856.

161. Gustav Adolph Blittkowski, New York—Improvements in repeating fire-arms.

Dated 23*rd January*, 1856.

181. Joseph Hopkinson, jun., Huddersfield—Improvements in apparatus connected with steam boilers.

Dated 24*th January*, 1856.

195. James Atkinson Longridge, Fludyer-street, Westminster—Improvements in the construction of ordnance and other vessels intended to resist internal pressure, and in the manufacture and method of discharging projectiles.

Dated 25*th January*, 1856.

201. George Gower Woodward, Kidderminster—Improvements in the manufacture of carpets.

Dated 28*th January*, 1856.

223. Harvey Hilliard, Glasgow—Improvements in articles of cutlery and in apparatus for sharpening and cleaning the same.

Dated 1*st February*, 1856.

277. Peter Armand le Comte de Fontainemoreau, 39, Rue de l'Echiquier, Paris—Improvements in the saponification of fatty matters. (A communication.)

Dated 2*nd February*, 1856.

291. George Napier, Bath-street, Glasgow—Improvements in "breaks" for railway and other carriages.

Dated 8*th February*, 1856.

337. Thomas Restell, New Kent-road—Improvements in breech-loading and revolving fire-arms and in cartridges.

Dated 13*th February*, 1856.

363. John Mills, Oldham—Improvements in the slide valves of steam engines.

Dated 21*st February*, 1856.

447. James Durell Greene, Craven-street, Westminster—Improvement in breech-loading fire-arms.

Dated 1*st March*, 1856.

525. William Crozier, Sunderland—The better extinction of fire, street watering, and other purposes.

Dated 13*th March*, 1856.

606. Christopher Duckworth and Thomas Marsden, Manchester—The manufacture of a new or improved woven fabric.

Dated 22*nd March*, 1856.

684. William Henry Barlow, Midland Railway, Derby—Improvements in covering and constructing bridges, viaducts, floors, and other structures of a like nature, when iron is used.

Dated 24*th March*, 1856.

693. Peter Brown and George Brown, Liverpool—Improvements in sizing and stiffening textile materials or fabrics by the application of new materials for those purposes.

Dated 28*th March*, 1856.

748. Samuel Getley, 6, Ivy-street, Birkenhead—Improvements in supplying and drawing water to and from cisterns.

Dated 29*th March*, 1856.

752. Alexander Sands, Manchester—Improvements in securing rails in railway chairs, and in the construction of railway chairs.
754. John Swyney, Massachusetts, U.S.—Improvements in breech-loading magazine fire-arms.
756. John James Rippon, Oakenshaw Print Works, near Accrington—Improvements in rollers or cylinders for printing fabrics.
758. James Eives, 17, Cornhill—A new mode of preparing fibres from plants. (A communication.)
760. Herbert Newton Penrice, Capt., R.E., Newcastle-upon-Tyne—Improvements in machinery for driving galleries through rock and other strata.
762. Charles Benjamin Normand, Havre—Improvements in steam-boilers, in apparatus for applying heat to steam-boilers, and economizing heat of furnaces.
764. Charles Durand Gardissal, 10, Bedford-street, Strand—Improvements in steam-boilers. (A communication.)
765. Adolphe Guido, Versailles—Improvements in cleansing, washing, scouring wool and woollen fabrics and yarns.
766. Charles Durand Gardissal, 10, Bedford-street, Strand—A new compound of inflammable materials for the purpose of lighting fires in grates, stoves, furnaces, or other fire-places. (A communication.)

767. Charles Durand Gardissal, 10, Bedford-street, Strand—An improvement in screw stop-valves. (A communication.)

Dated 31st March, 1856.

769. James Hicks, Piddle Trenthide, Dorset—Improvements in stoves.

770. Benjamin Looker, jun., Kingston-upon-Thames—Improved mark or indicator to be let or fixed into the ground in burial grounds and other places.

771. Charles Jean le Mélorel de la Haichois, 39, Rue de l'Echiquier, Paris—Improvements in paving.

772. Henry Henderson, Glasgow—Improvements in stop-cocks or valves.

773. Charles Parker, Dundee—Improvements in machinery or apparatus for winding yarns or threads.

775. Thomas Waller Burrell, Fareham—Improvements in machinery for obtaining power by water. (A communication.)

776. Henry Cornforth, Birmingham—Improved manufacture of plated tea-pots and coffee-pots, and other vessels and articles of like manufacture.

777. Alexander Prince, 4, Trafalgar-square—Improvements in steel pens, for regulating the elasticity thereof. (A communication.)

778. George Thomas Smith, Northampton, and Joel Watts, Battersea—Improved lubricator.

779. Alfred Vincent Newton, 66, Chancery-lane—Improved machinery for folding paper. (A communication.)

Dated 1st April, 1856.

780. Joseph Bentley, Liverpool—Improvements in breech-loading fire-arms, and in the cartridges to be used therewith.

781. Charles Baptiste, Toulouse (France)—Improvements in machines for manufacturing tenons and mortices. (Partly a communication.)

782. James Ashton, Hyde Corn Mills, Hyde—Improvements in machinery or apparatus for bruising or breaking grain or other matters preparatory to grinding.

783. Alfred Southam, Samuel Stead, and James Martin, Manchester—Separating or recovering the vegetable substances from mixed fabrics, and rendering the same vegetable substances again available for manufacturing purposes.

784. Armand Louis André Herbelot, Paris—A new method of obtaining a continual motive power.

785. Etienne Laporte, Paris—The application of certain new materials in the manufacture of bougies, candles, and other similar articles.

786. John Gray, Peckham—Improvements in steam-boilers, furnaces, and fire-bars.

787. Alfred Vincent Newton, 66, Chancery-lane—Improved apparatus for ascertaining gradients. (A communication.)

788. William Roberts, Millwall, Poplar—Improvements in the construction of pumps.

789. John Paterson, Linlithgow—Improvements in the manufacture of paper.

Dated 2nd April, 1856.

790. Frederic Grice, West Bromwich—Improved machinery for the manufacture of bolts, rivets, spikes, screw blanks, and nuts.

792. Richard Roberts, Manchester—Improvements in omnibuses and other passenger carriages.

793. Peter M'Gregor, Falcon Works, Manchester, and Thomas Marquis, Huncoat, near Accrington—Improvements in the machines for spinning called "throstles."

794. James Smith Cottrill, Great Lever, near Bolton—Improvements in presses.

795. Charles Ellis, Stockport—Improvements in machinery or apparatus for spinning and doubling cotton and other fibrous substances.

796. George Bell Galloway, 42, Basinghall-street—Improvements in propelling vessels.

797. Lodowiska Bonnard, Tottenham Court-road—Improvements in collapsible or folding hats and bonnets, and in flexible articles to be applied to other coverings for the head. (A communication.)

798. George Gwynne, Trafalgar-square—Improvements in treating fatty, oily, and greasy bodies.

799. Henry George Hine, Brecknock-street, Camden-town—Improvements in children's and invalids' carriages, called "perambulators."

800. Henry Smith, Lee—Apparatus for cleaning and polishing boots and shoes.

801. James Samuel, Great George-street, Westminster, and John Nicholson, Bow—Improvements in steam and other vapour engines.

802. Alfred Vincent Newton, 66, Chancery-lane—Improvements in the construction of rotary steam-engines, applicable in part to pumps for raising and forcing fluids. (A communication.)

Dated 3rd April, 1856.

803. William Jenkins, Neath Abbey—Improved method of manufacturing copper rollers for calico printing.

804. Edmund Alfred Pontifex, Shoe-lane, and William Needham, Vauxhall—Improvements in the manufacture of preparations or primings used for preparing canvass, wood, or other material for the reception of pigments or colours.

805. Charles Colonel Smith, Wolverhampton—Improved method of working brakes for stopping machinery used for raising coals and minerals, and for stopping steam-engines and other motive power engines.

806. William Billinton, Great George-street, Westminster—Improvements in strengthening and preserving wood and timber.

807. Henry Robert Abraham, Essex-house, Barnes—Improvements in passenger, exhibition, or delivery tickets or checks, and in the method of indicating and recording passenger traffic, or delivery of goods, and in the machines used as tell-tales for such purposes.

808. Thomas White, jun., Portsmouth—Improvements in slips and ways for receiving ships or vessels requiring repair, and for apparatus to be used for hauling up ships or vessels.

809. Frederick William Kitson, Leeds—Improvements in the manufacture of railway wheels.

810. John Hamilton Glassford, Glasgow—Improvements in the production or preparation of printing surfaces.

811. James Bannehr, Exeter—Improvement in manufacturing or preparing paper for, and in mounting copies of, written documents thereon.

812. John Fernie, Forrester-street, Derby—Improvements in hoists by combining steam and a hydraulic column.

Dated 4th April, 1856.

813. Paul Emile Chappuis, 69, Fleet-street—Improvements in looking glasses to render them double-reflective.

814. Robert Halliwell, Bolton-le-Moors—Improvements in the machines for spinning called "self-acting mules." (A communication.)

815. Charles Durand Gardissal, 10, Bedford-street, Strand—The treatment or preparation of fabrics or textile materials to be dyed or printed. (A communication.)

816. Samuel Fisher, Birmingham—Improvements in the manufacture of anchors, shafting for mill and engine purposes, axles, cranks, and spindles, and in the furnaces or muffles used in the said manufacture.

817. John Roberts, Upnor, Kent—Improvements in the manufacture of ornamental tiles.

818. Charles William Ramié, 73, Denbigh-street, Pimlico—Improvements in constructing the permanent ways of railways.

819. George Tomlinson Bousfield, Sussex-place, Loughborough-road, Brixton—Improvements in moulding planes. (A communication.)

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

862. Peter Bancroft, Edmund-street, Liverpool, and Stephen White, Bond-street, Liverpool—A method of manufacturing certain oils or oily substances obtained from the petroleum, commonly called earth oil, found in certain districts of the Birman empire and elsewhere.—10th April, 1856.

868. Lewis Normandy, 67, Judd-street, Brunswick-square—Improvements in the mode of writing and printing music to facilitate the study thereof.—11th April, 1856.

900. George Tomlinson Bousfield, Sussex-place, Loughborough-road, Brixton—Improvements in surface or fresh water condensers, chiefly applicable to steam-engines.—15th April, 1856.

WEEKLY LIST OF PATENTS SEALED.

Sealed April 18th, 1856.

1765. John Benjamin Daines.
2339. John Cheesman Wagstaff.
2344. William Smith.
2352. Pierre Antoine Henry Parant.
2355. Frederic Whitaker.
2360. Alexander McGlashan and Edward Field.
2361. Charles Lenny.
2410. Joseph Whitworth.
2419. William Naylor.
2426. Thomas Webster Rammell.
2487. Richard Archibald Brooman.
2532. Alfred Vincent Newton.
2582. Charles Crum and Charles Paul.
2614. William Harvey.
2630. Alexandre Tolhausen.
2672. Edward Peyton and Duncan Morrison.
2826. George Tomlinson Bousfield.
2828. Edward Orange Wildman Whitehouse.
2839. William Clay.
2894. James Murdoch.
2923. Thomas Duppa Duppa.
38. George Tomlinson Bousfield.
117. John Hamilton, jun.
119. John Hamilton, jun.
273. Edward Schischkar.
294. William Goodman.
350. Louis Schwartzkopff.
354. William Horatio Harfield.
384. William Hamond Bartholomew.
470. Henry Loveridge.
484. Edward Slaughter.

Sealed April 22nd, 1856.

2369. John Bellamy.
2378. John Healey, John Foster, and John Lowe.
2383. Charles Crickmay and Frederick Joseph Clowes.
2385. Eugène Hippolyte Rascol.
2387. Henry Tritton.
2389. James Platt and John Whitehead.
2393. John Pinches.
2397. Edward Stark.
2408. George Riley.
2467. William Prior Sharp and William Weild.
2475. Arthur Dobson.
2483. George Baring Locke.
2495. Edward Jeffreys.
2521. John Raywood.
2525. William Henry Walenn.
2687. Richard Archibald Brooman.
171. Joseph Francis.

Patents on which the Third Year's Stamp Duty has been Paid.

April 14th.

898. Moses Robinson.
906. John Wallace Duncan.
916. George Titterton.

April 15th.

935. William Fawcett and Francis Best Fawcett.
938. François George Sicardo.
1201. Peter Armand le Comte de Fontainemoreau.

April 17th.

943. Frederick Henry Smith.
957. Sir William Snow Harris.
960. Charles Reeves, jun.
964. Philip Harris, Lieut., R.M.

April 19th.

959. Thomas Dunn.
981. Henry Houldsworth.
983. William Johnson.
1010. John Hetherington, John Dugdale, and Ed. Dugdale.